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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/595,523

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Masahiro Nakayama

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29453

7590

12/23/2009

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JAPAN

EXAMINER

LEE, JAE

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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/595,523	<b>Applicant(s)</b> NAKAYAMA ET AL.	
	<b>Examiner</b> JAE LEE	<b>Art Unit</b> 2895	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 23 September 2009.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1,2 and 11-14 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1,2 and 11-14 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |                                                                                                                                                           |                                                                                         |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)                                                                               | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948)                                                                       | 5) <input type="checkbox"/> Notice of Informal Patent Application                       |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>09/18/2009,08/20/2009,06/23/2009</u> . | 6) <input type="checkbox"/> Other: _____                                                |

## DETAILED ACTION

### *Response to Arguments*

1. Applicant's arguments filed 09/23/2009 have been fully considered but they are not persuasive.

Applicant contends that although the Wilk et al. reference teaches the use of GaN, it does not concern with construction of light-emitting diodes. Examiner submits, however, typical group III-V compounds such as GaN are conventionally used for construction of LEDs as taught by Yang et al. and that whether Wilk et al. concerns LEDs or not is irrelevant to the argument. Furthermore, having an epitaxially grown surface is disclosed by Wilk et al., but whether the surface already has an epitaxially grown surface or not is also irrelevant because the etching method to producing the mirror-like, planar surface for epitaxial growth can be performed in order to have a smoother surface.

Applicant also contends with regards to the contamination that the contamination of Wilk et al. occurs inside the bulk substrate, not on the surface. Examiner respectfully submits however that the defects are technically "on" the surface, even though the contaminants are inside the surface. Furthermore, the defects can also be present "on" the surface if the defects are part of the top surface of the substrate. In addition, the applicant's arguments regarding the use of Cr atoms of Freeouf et al. as charge traps of Wilk et al. are not persuasive. It is clear that the charge traps can be defined as "contaminants" as disclosed by Wilk et al. (i.e. then what is "contamination"?). Furthermore, Freeouf et al. is simply utilized to demonstrate how a charge trap could also be chromium. Combining these two references, it would have been obvious to one

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of ordinary skill in the art at the time the invention was made to be cognizant and recognize that chromium can be a charge trap.

### ***Drawings***

2. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the "gallium nitride semiconductor substrate having a mirror-like, planar surface", "a gallium nitride semiconductor substrate...the device-forming epitaxial film has been grown is a complex of faces in which GA is exposed", and "a gallium nitride semiconductor...wherein the device-forming epitaxial film has been grown only on the faces in which Ga is exposed" must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an

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application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

***Claim Rejections - 35 USC § 112***

3. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

4. **Claims 13 and 14** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

The specification sections referred by the applicant does not disclose where the device-forming epitaxial film is grown ONLY on the faces in which Ga is exposed.

5. **Claims 13 and 14** are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

The examiner is unclear as to how to grow a device-forming epitaxial film on regions where only the Ga faces are exposed. The examiner is confused how only the gallium faces are exposed without the nitrogen atoms being exposed.

**Note : Claims 13 and 14** have not been rejected over the prior art because, in light of the 35 U.S.C. 112 rejections supra, there is a great deal of confusion and uncertainty as to the proper interpretation of the limitations of the claims; hence, it would not be proper to reject the claims on the basis of prior art. As stated in *In re Steele*, 305 F.2d 859, 134 USPQ 292 (CCPA 1962), a rejection under 35 U.S.C. 103 should not be based on considerable speculation about the meaning of terms employed in a claim or assumptions that must be made as to the scope of the claims.

### ***Claim Rejections - 35 USC § 103***

6. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

7. **Claims 1, 2, 11, and 12** are rejected under 35 U.S.C. 103(a) as being unpatentable over Wilk et al. in view of Freeouf et al. and Yang et al. and further in view of Motoki et al. (USP# 6,468,347 B1, hereinafter Motoki et al.).

With regards to **claims 1 and 2**, Wilk et al. teaches a gallium-nitride semiconductor substrate onto which film has been epitaxially grown, the gallium-nitride substrate therein contaminated on its epitaxial-film side at a density level of from  $15 \times 10^{10}$  to  $10 \times 10^{11}$  atoms/cm<sup>2</sup> (or  $5 \times 10^{11}$  as per **claim 2**) (see ¶17, ¶27).

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Wilk et al., however, does not teach growing a light-emitting device during the epitaxy process.

In the same field of endeavor, Yang et al. teaches how traditional light emitting diodes uses III-V compounds by using epitaxial wafer growth technology (see ¶2).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to utilize III-V compounds for light emitting diodes since it is make conventional and well-known as taught by Yang et al.

Wilk et al. also does not teach the contaminant to be one or more selected from Si, Cr, Mn, Fe, Ni, Cu, Zn, and Al.

In the same field of endeavor, Freeouf et al. teaches how chromium atoms can function to trap charge carriers (see col. 16, lines 50-52, trap charges present in Wilk et al. in ¶27).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time the invention was made to acknowledge and recognize that chromium atoms are definitely one type of contaminant that can cause trapping of charge carriers as taught by Freeouf et al.

Wilk et al. also does not teach the mirror-like planar surface on the GaN layer.

In the same field of endeavor, Motoki et al. teaches how polishing the surface of a GaN layer will produce a mirror-like finish which will reduce the number of etch pits in the surface which would hinder GaN device efficiency such as a LED (see col. 20, lines 5-9, see col. 23, lines 31-34).

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Therefore, it would have been obvious to have a mirror-like planar surface on GaN because this will reduce the number of etch pits present in the surface as taught by Motoki et al.

With regards to **claims 11 and 12**, Wilk et al. and Yang et al. teaches a gallium-nitride semiconductor substrate as set forth in **claims 1 and 2**, wherein the substrate surface on which the device-forming epitaxial film has been grown is a complex of faces in which Ga is exposed, and faces in which N is exposed (the gallium nitride substrate taught by Yang et al. will have exposed faces of gallium atoms and nitrogen atoms when the structure of gallium nitride is viewed at the atomic level).

### ***Conclusion***

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of



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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JAE LEE whose telephone number is (571)270-1224. The examiner can normally be reached on Monday - Friday, 7:30 a.m. - 5:00 p.m. EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Drew Richards can be reached on 571-272-1736. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Jae Lee/  
Examiner, Art Unit 2895

/N. Drew Richards/  
Supervisory Patent Examiner, Art Unit 2895

JML